

1

Nothing Buttery from Atomism to the Enlightenment

“In the last ten years we have come to realize humans are more like worms than we ever imagined,” declares biologist Bruce Alberts, former president of the National Academy of Sciences.¹ Geneticist Glen Evans at the University of Texas Southwestern Medical Center agrees. Genetically speaking, he reports, “the worm represents a very simple human.”²

Other biologists prefer to think that humans are actually oversize *Drosophila melanogaster*—fruit flies. “In essence, we are nothing but a big fly,” insists Charles Zuker, genetic researcher and professor of biology at the University of California at San Diego.³

Or perhaps humans beings are merely overgrown mice. After all, “we share 99 percent of our genes with mice, and we even have the genes that could make a tail,” claims British scientist Jane Rogers, who worked with other researchers to publish the mouse genome in 2002. According to one journalist, “the genetic blueprint of the mouse” produced by Rogers and other scientists demonstrates that “there isn’t much difference between mice and men.”⁴

Apparently there is even less difference between men and chimps. “We humans appear as only slightly remodeled chimpanzee-like apes,”⁵ insists Morris Goodman of Wayne State University, coauthor of a 2003 study which concluded that “chimpanzees are more closely related to

people than to gorillas . . . and probably should be included in the human branch of the family tree.”⁶ Goodman complains about the traditional view of human beings that “emphasizes how very different humans are from all other forms of life,” deriding it as contaminated by “anthropocentric bias.” In reality, according to Goodman, “the molecular genetic view . . . places all the living apes (gibbons, orangutans, gorillas and chimpanzees) with humans in the same family and within that family barely separates chimpanzees from humans.”⁷

Few people today would deny that human beings can learn important things about themselves by studying other animals, but many scientists want to go considerably further. They seem to think that studying worms or flies or chimps will reveal in time all the mysteries of the human soul. They are inspired in this belief by a powerful assumption enshrined at the heart of modern science: the assumption that the material universe is the sum of reality. Scientists “have a prior commitment . . . to materialism,” asserts Harvard biologist Richard Lewontin, adding that scientists are compelled by their “*a priori* adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations, no matter how counter-intuitive, no matter how mystifying to the uninitiated. Moreover, that materialism is absolute.”⁸ This commitment to what some have called “scientific materialism” has led ineluctably to reductionism in the natural and social sciences during the past century, as those speaking in the name of science have attempted to show how everything that exists—including human action and thought—can be fully explained as the products of unintelligent matter and motion.

To borrow the words of political philosopher Leo Strauss, scientific materialism has tried “to understand the higher in terms of the lower: the human in terms of the subhuman, the rational in terms of the subrational.”⁹ According to scientific materialism, the parts are more important than the whole—to the degree that sometimes the whole seems to be a lot less than the sum of its parts. The end result is what the late British neurophysiologist Donald MacKay liked to call the “nothing buttery” syndrome,¹⁰ the attempt to explain every fact of human existence as “nothing but” some nonrational material process—as in, “Our enjoyment of symphonies is nothing but the conversion of mechanical energy into electrical signals by the cells in our inner ear,”¹¹ or “Morality . . . is merely [i.e., ‘nothing but’] an adaptation put in place to further our reproductive ends,”¹² or “your joys and your sorrows . . . your sense of personality and free will, are in fact no more than [i.e., ‘nothing but’] the behavior of a vast assembly of nerve cells and their associated molecules.”¹³ Even the realms of mind and spirit cannot escape from the reductionists’ onslaught, because in their view “matter is the ground of all existence; mind, spirit, and God as well, are just

[i.e., ‘nothing but’] words that express the wondrous results of neuronal complexity.”¹⁴

While the triumph of materialistic reductionism over nearly every field of human endeavor is of recent vintage, both materialism and reductionism have deep roots in Western culture. The story of their rise to ascendancy is a tangled and multifaceted one, and this book cannot tell it exhaustively. But it can present some of the highlights. It is usually perilous to try to pinpoint the originator of an idea. The very attempt presumes a universal knowledge of human history that finite human beings probably can never attain. But stories must have a beginning, and so if we are to tell the story of materialism’s development, we must start sometime and somewhere. The sometime is more than two millenia ago. The somewhere is Greece.

Atoms and Void: Materialism in Greece and Rome

It was a hot midsummer’s day, and three elderly pilgrims walked the dusty road from the city of Cnossus on the island of Crete to the grotto of Zeus. Situated on top of Mount Ida, the grotto was the legendary birthplace of the deity who was chief in the pantheon of the Greek gods. One of the pilgrims, Cleinias, was a native Cretan. The second pilgrim, Megillus, was a Spartan. The third man came from Sparta’s historic enemy, Athens.¹⁵

The walk was a long one, and so the men passed the time in conversation. Eventually their discussion turned toward the gods, and the Athenian spoke of philosophers who claimed that planets and stars, animals, and even human beings arose by “nature and chance” from the material elements of fire, water, earth, and air.¹⁶

“In this manner the whole heaven has been created, and all that is in the heaven, as well as animals and all plants . . . not by the action of mind, as they say, or of any God, or from art, but as I was saying, by nature and chance only.”¹⁷ For such philosophers, the Athenian continued, the fundamental reality is material, and everything that is real is a byproduct of that material reality, even the human soul. As for religion and morality, the naturalistic philosophers claimed that they have no basis in nature and are transient and changeable according to the dictates of the time.

“These, my friends, are the sayings of wise men, poets and prose writers, which find a way into the minds of youth. They are told by them that the highest right is might, and in this way, the young fall into impieties, under the idea that the Gods are not such as the law bids them imagine.”¹⁸

“What a dreadful picture . . .,” replied the Cretan Cleinias in shock, “and how great is the injury which is thus inflicted on young men to the ruin both of states and families.”¹⁹

The Athenian went on to indict the naturalistic philosophers for reversing that which is first and last. They wrongly think that justice, beauty, and the human soul are byproducts of the physical body, when in fact “the soul is prior to the body.” Because the soul is prior to the body, “characters and manners, and wishes and reasonings, and true opinions, and reflections, and recollections”—in short, all the qualities that typify mind—are also prior to matter, and it is an error to try to reduce mind to matter rather than treat it as something with independent dignity.²⁰

This imaginary conversation between Cleinias, Megillus, and the unnamed Athenian appears in Book X of Plato’s *Laws*, probably one of the last dialogues written by the great Athenian philosopher. Plato (427?–347 B.C.) and his pupil Aristotle (384–322 B.C.) were the most compelling critics of materialism and reductionism in the ancient world.²¹ Some of the “pre-Socratic” philosophers whom Plato and Aristotle critiqued were possibly not materialists in the strict sense of the term.²² But they supplied fertile soil out of which a full-blooded materialism grew, and by the fifth century B.C. Leucippus and his student Democritus (460?–357 B.C.) were spreading a wholly materialistic philosophy that became known as atomism.

While trustworthy knowledge about Leucippus and Democritus is scant, they apparently believed that everything—plants, animals, the operations of the senses, and mind itself—could be reduced to atoms in motion.²³ In their view, sense perception and thought were purely mechanical processes. According to Aëtius, Leucippus and Democritus believed that “sensations and thoughts are alterations of the body” that “take place by the impact of images from outside. Neither occurs to anyone without the impact of an image.”²⁴ Thus, in the atomists’ view, a person can see a tree because the tree gives off atoms that ultimately enter his eyes.²⁵ The problems with this mechanistic view of mind were apparent even to the ancients. Ridiculing the atomists’ conception, Cicero a few centuries later asked “whether . . . whenever he thought about Britain, an ‘image’ had detached itself from that island to come and hit him in the chest.”²⁶

Determinism was another key feature of the philosophy of the early atomists. In the words of Leucippus, “nothing occurs at random, but everything for a reason and by necessity.”²⁷ Democritus likewise believed that “everything happens according to necessity.”²⁸ It is easy to see how their determinism followed from their atomism. According to Leucippus and Democritus, the atoms in the void were a sort of perpetual motion machine, the motion of each atom being produced by a prior collision with another atom. Almost by definition there was no room for freedom in their system.

In his magisterial history of Greek philosophy, W. K. C. Guthrie suggests that Leucippus and Democritus “encouraged the faith of all who in

later ages have been attracted by the notion of man as a machine.” The two atomists further sparked debate over whether the universe displayed the hallmarks of design. “Has matter formed itself unaided into organisms of an almost incredible complexity, delicacy and adaptability to purpose, or has this order and efficacy been imposed from outside by a rational agent working to a plan?” According to Guthrie, “it was Democritus who first compelled philosophers to take sides by his detailed exposition of a system in which intelligence, direction and purpose were epiphenomena emerging at a late stage from nothing but the undesigned clash and recoil of individually inanimate particles.”²⁹

After the deaths of Leucippus and Democritus, atomism was revived by Epicurus (342–270 B.C.), who likewise maintained that “the universe is bodies and space,” with the primary bodies being “indivisible and solid” atoms.³⁰ For Epicurus, everything that exists was ultimately reducible to atoms in motion, including the human soul. Those who insisted that “the soul is incorporeal” were “talking idly.”³¹ The soul is just as corruptible as the rest of the human body, and so “when death comes . . . we do not exist.”³²

Epicurus did make one major break with Leucippus and Democritus: He defended free will. The better man, according to Epicurus, is one who “laughs at destiny” and “thinks that with us lies the chief power in determining events,” because though some events “happen by necessity and some by chance,” there are still some remaining events that “are within our control.”³³ Epicurus seemed to provide a theoretical foundation for free will within his atomic system by suggesting that atoms occasionally swerved unpredictably, so that there were at least some atomic movements that were not dictated by prior collisions with other atoms.³⁴ Whether Epicurus’s concession to indeterminacy actually allows for human freedom and responsibility (or even makes sense, given his overall system of physical causes) is another matter. As Frederick Lange pointed out in his *History of Materialism*, “the unconscious arbitrariness” of the atomic behavior in question seems to refute “any intimate connection between the actions of a person and his character.”³⁵

Epicurus attempted to connect his ethical teachings to his atomic theory, grounding his ethics on the sensations of pleasure and pain. To pursue pleasure and avoid pain was the primary maxim of his ethical philosophy. But he denied that he was a defender of unbridled hedonism.³⁶

The materialistic philosophy of Epicurus was later propagated in Rome by the Roman poet Lucretius (96?–55 BC), who made the materialistic conception of the universe the heart of his poem *De Rerum Natura* (“On the Nature of Things”). Running more than seven thousand hexameter lines, *De Rerum Natura* was a remarkable achievement under any circumstances,

but especially so considering that Lucretius (if one can trust the account of Jerome) underwent fits of insanity while writing it and committed suicide before bringing the poem to completion.³⁷

Like the Greek atomists before him, Lucretius saw human beings and the rest of nature as products of the mindless collisions of atoms. The first and essential things were atoms in motion, and everything else came out of them:

Neither by design did the primal germs
 'Stablish themselves, as by keen act of mind,
 Each in its proper place; nor did they make,
 Forsooth, a compact how each germ should move;
 But since, being many and changed in many modes
 Along the All, they're driven abroad and vexed
 By blow on blow, even from all time of old,
 They thus at last, after attempting all
 The kinds of motion and conjoining, come
 Into those great arrangements out of which
 This sum of things established is create . . .³⁸

De Rerum Natura has been called “the greatest monument in Latin poetry,”³⁹ and its language is echoed repeatedly by the celebrated Virgil.⁴⁰ Despite Lucretius’s literary influence on Virgil, however, the philosophy he championed failed to thrive. It is not difficult to understand why. The tremendous gulf between living and nonliving matter, the equally cavernous gap between rational and irrational living beings, all seemed to make incredible the notion that intelligence and the rational ordering of the natural world could be produced by blind forces operating on irrational matter. The idea that mind was preeminent over matter seemed confirmed by common sense, and Plato and Aristotle and their followers pressed this point against the early materialists with vigor. Indeed, their alternative theories of mind and matter were so persuasive that they supplied the foundations for intellectual life during the next two millennia.

Plato and Aristotle differed in some of their metaphysical principles, but they were united in opposing the materialist attempt to reduce mind to matter. In Aristotle, the defense of mental independence comes out clearly in his famous theory of causation. Aristotle taught that there are four primary kinds of causes: material, efficient, formal, and final.⁴¹ The *material* cause of something is the matter from which it is made. The material cause of a bronze statue is the metal from which it was constructed, just as the material cause of a human being is the chemical and cellular materials that make him up.⁴² The *efficient* cause of something is “that which brings about

a change" in it.⁴³ The efficient cause of a baby, for example, is his or her parents. Modern science generally proceeds as if material and efficient causes together provide an exhaustive explanation of the world around us. But Aristotle would argue that two of the most important kinds of causes—the formal and the final—cannot be understood simply as matter or matter acting on matter.

The formal cause of something is the pattern or idea (i.e., the "form") that makes the thing what it is.⁴⁴ This pattern or idea is not itself material, and it is what allows us to differentiate between a stack of cedar logs and a handmade cedar chest. Both the logs and the chest are fashioned from the same material. What differentiates them, then, is not a difference in matter but a difference in form. As Harry Jaffa observes, "the fact that the form of a thing can be separated from its matter is the very heart of human understanding, and of human intelligence. Without this possibility, modern science itself would not be possible, because all science presupposes the detachment of the mind from its object as a condition of human speech about the object."⁴⁵

Aristotle's final cause (or *telos*) also transcends the merely material. The final cause of something is the reason for which it exists—in other words, its purpose. The final cause of someone exercising at a health club might be health.⁴⁶ In many instances, the formal cause of something is also its final cause. The final cause of a human fetus, for example, is to grow into the mature form of a human being.

While materialism tends to generate reductionistic explanations, formal and final causation tend to encourage teleological explanations. Teleology means "study of purpose," and it is the effort to understand things in terms of their overall ends. While reductionism tries to understand the whole in light of its parts, teleology tries to comprehend the parts in light of the whole. Consider the oft-cited example of an oak tree. According to the Aristotelean approach, one can understand more about what an oak tree is by looking at the attributes of a fully grown oak tree than by trying to describe it as nothing more than an overgrown acorn. Similarly, the best way to understand human beings is to look at who they are as an integrated whole, rather than breaking them down into their material or psychological building blocks.

For much of modern science, which thrives on reductionism, teleology is a bad word. Despite the modern dismissal of teleology, however, there remains something appealing about the approach, as a simple example may demonstrate. Imagine a table with two baking pans on it. One pan is filled with raw eggs, flour, baker's chocolate, vegetable oil, and sugar. The other pan is filled with a German chocolate cake that has just been baked. In a reductionistic framework, the contents of both pans are essentially

equivalent, for they are reducible to the same raw ingredients. Yet what person would really think it adequate to describe the cake as “nothing but” raw eggs, flour, baker’s chocolate, vegetable oil, and sugar? Most people would find such a description woefully incomplete in explaining what a chocolate cake really is. As most people understand almost intuitively, the cake is more than the sum of its parts. That is why if offered a choice between a serving of the unmixed mess in pan one or a piece of the finished cake in pan two, they will invariably prefer the latter. If one can apprehend why the cake in the example is qualitatively better than its raw unmixed ingredients, he will have grasped why reductionistic explanations are far from a complete description of reality—and why the teleological theories of Plato and Aristotle exerted an almost insurmountable influence on the Western mind for so long.

After Lucretius, the rise of Christianity posed a further obstacle to the widespread acceptance of materialism. Christian beliefs about personal immortality, the Holy Spirit dwelling inside believers, and God’s eternal nature were hard to square with materialist accounts of the universe, although a few thinkers such as Tertullian attempted a partial reconciliation.⁴⁷ Materialism became so discredited that it is difficult to find a prominent thoroughgoing materialist for well over a thousand years after the birth of Christ.⁴⁸ Not until the 1500s did materialism once again become a hotly contested public issue.

Nature the Machine: Materialism in the Sixteenth and Seventeenth Centuries

By anyone’s estimation, the boy was brilliant. Forbidden by his father to study mathematics during his childhood, he taught himself the rudiments of geometry without the benefits of either books or tutors, working out the first thirty-two propositions of Euclid by age twelve. A few years later he joined meetings of a group of distinguished mathematicians in Paris. At sixteen he turned inventor, beginning work on a machine to compute sums. Within three years he had produced the world’s first digital calculator.⁴⁹

The boy’s sister would later recall that the calculator “was looked upon as a thing perfectly new in Nature” for it “brought . . . within the small Compass of a Machine” complex logical operations that previously had been reserved for the human mind.⁵⁰ The device was called the Pascaline—after its creator, Blaise Pascal (1623–62), later famous for the religious and philosophical reflections collected in his *Pensées*.

One of those who learned about the young Pascal’s miraculous device was an English expatriate living in Paris. Reflecting upon the revolution-

ary implications of the calculator, the Englishman reportedly declared: "Brass and iron have been invested with the functions of brain and instructed to perform some of the most difficult operations of mind."⁵¹

The declaration may be apocryphal, but the Englishman was real, and it is certain that he had become intrigued by the machine-like features of the human brain. Whether he gained inspiration for his views from Pascal's calculator we may never know for sure, but when he eventually published his own views on the human mind, the Englishman shocked many of his contemporaries by his boldness. This was despite his self-proclaimed timidity.⁵²

The Englishman was Thomas Hobbes (1588-1679). Perhaps best remembered today for his observation that the life of man in a state of nature is likely to be "solitary, poore, nasty, brutish, and short,"⁵³ Hobbes also was probably the most thoroughgoing materialist of his day. Believing that "life is but a motion of Limbs," he openly wondered why devices such as watches that "move themselves by springs and wheelles" could not be said to have "an artificial life." After all, wrote Hobbes, "what is the *Heart*, but a *Spring*; and the *Nerves*, but so many *Strings*; and the *Joynts*, but so many *Wheelles*, giving motion to the whole Body . . . ?"⁵⁴ Hobbes's theory of mind came straight out of Democritus and Epicurus. In his view, human cognition was nothing more than the residue of the impact of external objects on our bodies.⁵⁵

Given Hobbes's mechanical conception of man, it should be no surprise that he embraced a deterministic psychology. Hobbes did not claim that a man could not "act according to his *will*," but he insisted that the "will" itself was already determined. To claim that a man could determine his own will was "absurd."⁵⁶ "Every act of mans [sic] will, and every desire, and inclination proceedeth from some cause, and that from another cause, which causes in a continual chaine . . . proceed from necessity."⁵⁷ Thus, "*free from necessitation . . . no man can be.*"⁵⁸

Although regarded by many as an atheist during his own lifetime, Hobbes did not openly reject Christianity. Nevertheless, his theology was far from orthodox. He argued that it was incoherent to believe in an incorporeal being, and so concluded that God himself must be corporeal.⁵⁹ He thought that human beings ceased existence upon the death of their bodies and God recreated them later at a general resurrection.⁶⁰ He redefined Satan as "any Earthly enemy of the Church,"⁶¹ and he radically reinterpreted the Trinity, identifying the Holy Spirit with the apostles who were appointed to represent God after Jesus's resurrection.⁶²

Hobbes was the forerunner not only of much of modern materialism, but of modern theories of biblical criticism. In his own day, however, he "was a rather lonely figure," as Stanley Jaki points out.⁶³ Other thinkers

of the era approached the materialism of Hobbes, but they stopped short of asserting that man was merely a machine. For example, Francis Bacon (1561–1626), who preceded Hobbes, paved the way for a mechanistic view of nature, but he was cautious about applying his view to human beings.⁶⁴

The seventeenth century is commonly referred to as the age of the Scientific Revolution. Given the robust natural science that existed in the Middle Ages, this appellation is probably a misnomer.⁶⁵ Nevertheless, it is surely the case that by the 1600s increasing interest was being expressed by many thinkers in understanding the material basis of the natural world. An interest in matter, however, does not necessarily make one a materialist. To believe that the natural world has a material basis is not the same thing as claiming that everything must be reduced to materiality. Accordingly, some thinkers who argued most convincingly for viewing the natural world as a machine insisted with just as much vigor that the human mind could never be reduced simply to a material mechanism. The most famous philosopher of the period who adopted this view was undoubtedly René Descartes (1596–1650), who bequeathed a tangled legacy that is still energetically disputed.⁶⁶

On the one hand, later materialists took inspiration from Descartes' mechanical account of the natural world, which claimed that "there is nothing in the whole of nature . . . which is incapable of being deductively explained on the basis of" material principles relating to atoms in motion.⁶⁷ Descartes expanded his materialism to encompass the human body as well. In his *Treatise on Man*, he implied that the human body was "nothing but a statue or machine made of earth."⁶⁸ On the other hand, defenders of the independent reality of mind could take comfort from Descartes' insistence that "the soul is entirely distinct from the body"⁶⁹ and that "our knowledge of thought is prior to, and more certain than, our knowledge of any corporeal thing."⁷⁰ The coherence of Descartes' view may be debated, but it is difficult to regard him as a materialist on his own terms.

The same is true for John Locke (1632–1704) in England, who argued in his *Essay Concerning Human Understanding* that it was not logically impossible for matter to be endowed with the property of thought. Some concluded from this statement that Locke actually believed in the existence of thinking matter.⁷¹ But that is not what he wrote. Locke claimed that it was not a logical contradiction to believe that God could endow matter with the property of thought.⁷² But he nowhere asserted that this was in fact the case. Indeed, Locke's main point was that it was impossible for human beings to gain certain knowledge by reason about whether human rationality inhered in an immaterial soul or a thinking body. According to Locke, both alternatives are "clogged with equal difficulties," and we should be content to remain in a state of ignorance about the ultimate nature of the

mind.⁷³ We should accept the fact that we are thinking beings and proceed from there.

If Locke had said nothing else, it still would not have been accurate to regard him as an avowed materialist. But in other comments he made clear how profound the difference was between his views and a materialist understanding of mind. While Locke did not regard it as a contradiction for God to endow matter with thought, he did regard it as a contradiction to believe that matter in and of itself produced the ability to think.⁷⁴ Repudiating the views of the ancient atomists, Locke wrote that it is impossible to believe that intelligence can somehow arise from the chance organization of matter. Indeed, it is

as impossible that things wholly void of knowledge, and operating blindly, and without any perception, should produce a knowing being, as it is impossible that a triangle should make itself three angles bigger than two right ones. For it is as repugnant to the idea of senseless matter, that it should put into itself sense, perception, and knowledge, as it is repugnant to the idea of a triangle, that it should put into itself greater angles than two right ones.⁷⁵

According to Locke, intelligence must proceed from another mind, not matter. In his view, that mind must be God.⁷⁶ Locke also indicated that while we cannot know with certainty whether human beings have an immaterial soul or a thinking body, we can draw a conclusion based on probability, and here the evidence clearly pointed to the existence of something immaterial. In another section of the *Essay*, Locke defended at length the idea of immaterial beings, and in a response to one of his critics he said that “it is to the highest degree probable” that the thinking substance inside human beings is “immaterial.”⁷⁷

Like Descartes and Locke, Sir Isaac Newton (1642-1727) is often identified with the effort to reduce the universe to matter in motion. George Gilder, for example, says that Newton “had a vision of the world that was profoundly materialistic and determinist. He believed that at the basis of the universe were solid, immutable, impenetrable, mindless bits of matter. Further, he maintained that the universe was built up from these bits of matter in a great determinist machine, like the workings of a clock.”⁷⁸ Newton did think he could explain the movements of the planets by mechanical laws, and in his famous treatise *The Principia* (1686) he expressed his “wish” that “we could derive the rest of the phenomena of Nature by the same kind of reasoning from mechanical principles.”⁷⁹ But whatever the materialistic implications of his system, Newton himself was far from a thoroughgoing materialist. He clearly believed that blind, mechanical causes were not sufficient to explain the design of the universe and accept-

ed God as an incorporeal being who was omnipresent in the universe.⁸⁰ Moreover, like Locke and Descartes, Newton never had the presumption to try to reduce human beings to mere matter in motion.

This reluctance to reduce man to a wholly material being was widely shared during the seventeenth century. Some of the reluctance may have been due to fear of upsetting popular prejudices, but another factor was likely the sheer mystery of sentient life, which made the very idea of mind being produced by mindless matter seem incredible. As the following century would show, however, the reluctance in applying materialism to the human soul was not to last.

Man the Machine: Materialism during the Enlightenment

Situated on the banks of the Danube, the Bavarian university town of Ingolstadt was already centuries-old by the eighteenth century, when it became the setting for scientific experiments by a young college student that would shock the civilized world. For two years, the student had worked with an obsessiveness that verged on madness. He spent his days and nights with cadavers and body parts, trying to unlock the mysteries of life and discover how to infuse life into an inanimate body. When he finally found what he wanted, he put his knowledge to the test by creating a living being.

“It was on a dreary night of November that I beheld the accomplishment of my toils,” the student wrote later.

With an anxiety that almost amounted to agony, I collected the instruments of life around me, that I might infuse a spark of being into the lifeless thing that lay at my feet. It was already one in the morning; the rain pattered dismally against the panes, and my candle was nearly burnt out, when, by the glimmer of the half-extinguished light, I saw the dull yellow eye of the creature open; it breathed hard, and a convulsive motion agitated its limbs . . . For this I had deprived myself of rest and health . . . but now that I had finished, the beauty of the dream vanished, and breathless horror and disgust filled my heart.⁸¹

The student was Victor Frankenstein, the fictional mad scientist in Mary Shelley’s famous novel.

Written early in the nineteenth century, but set in the 1700s, *Frankenstein* depicted a nightmare vision of taking human power over nature too far. Though fanciful, the story intentionally drew on the scientific experiments of the time, especially the ongoing attempts to inject life into lifeless matter. These efforts to unlock the mystery of life dated back at least to 1768,

when the wife of Italian physiologist Luigi Galvani (1737–98) informed her husband of the convulsive movements of a dead frog in his laboratory. The frog had accidentally come into contact with an electrified scalpel. From this fact Galvani eventually theorized that a type of electricity was an animal's animating force.⁸² The quest to reanimate dead bodies took off from there. By the turn of the century, Galvani's nephew Giovanni Aldini was performing macabre experiments on decapitated oxes, horses, lambs, and humans.⁸³ "The unenlightened part of mankind are apt to entertain a prejudice against those . . . who attempt to perform experiments on dead subjects," Aldini later acknowledged, but he maintained that such experiments were justified because the object was to improve human welfare. "It is . . . an incontrovertible fact, that such researches in modern times have proved a source of the most valuable information."⁸⁴

Despite his assured tone, even Aldini admitted to having to overcome a sense of "repugnance" when he first turned to experiments on human beings.⁸⁵ Determined to understand the workings of what he called "the human animal machine,"⁸⁶ Aldini knew that he needed to procure bodies while they were still fresh and "retained . . . the vital powers in the highest degree of preservation." His solution? "I was obliged, if I may be allowed the expression, to place myself under the scaffold, near the axe of justice, to receive the yet bleeding bodies of unfortunate criminals, the only subjects proper for my experiments."⁸⁷

Aldini's first human experiments were conducted on the bodies of two young brigands who had been decapitated in Bologna in January 1802. Aldini started by applying electricity to various parts of their decapitated heads. This produced "the most horrid grimaces. The action of the eyelids was exceedingly striking."⁸⁸ Through further applications of electricity, the mouth of one of the heads generated a small amount of saliva, and the tongue moved back into the mouth after having been pulled out. Aldini also dissected the brains and applied electricity to their various components, producing further facial convulsions. Finally, Aldini applied electricity to the trunks of the bodies, which resulted in one of the corpses raising its forearm—"to the great astonishment of those who were present."⁸⁹

By 1803, Aldini was in London experimenting on the body of a British criminal who had been hanged. Aldini praised the "enlightened" British legislators who permitted the bodies of criminals executed in England to be handed over for medical experimentation.⁹⁰ His British experiment "surpassed our most sanguine expectations," he later wrote enthusiastically, adding that it had been so successful "vitality might, perhaps, have been restored, if many circumstances had not rendered it impossible."⁹¹ Aldini's experiments sparked imitators, as scientists across Europe rushed to discover the secret of animation.⁹²

In many respects, these experiments in the early 1800s were a fitting culmination of the natural philosophy of the previous century. For it was during the 1700s that scientific thinkers had pushed the boundaries of material explanations even into the human soul itself. By the mid-eighteenth century, the ideas that Hobbes had proclaimed like a voice in the wilderness in the 1600s had gained numerous disciples in both England and on the continent. Given the reduction of man to a completely material mechanism, it seemed eminently reasonable to try to discover the material process that would allow one to reanimate dead bodies.

Nowhere was the rise of an all-encompassing materialism more apparent than in France, where natural philosophers during the eighteenth century relentlessly pushed materialism to its logical conclusions. Two Frenchmen, in particular, laid the foundations for a vigorous and consistent materialism: Julien Offray de la Mettrie (1709–51) and Paul Henri Thiery, Baron d'Holbach (1723–89).

A physician, La Mettrie's major contribution to materialist thought was his tract *Man a Machine (L'Homme Machine)*, published in 1748. According to La Mettrie, "the human body is a machine which winds its own springs,"⁹³ and the "the diverse states" of the human mind "are always correlative with those of the body."⁹⁴ In other words, human beings are mechanisms whose rational life is completely dependent on physical causes. Those causes include everything from heredity to raw meat. In what has to be one of the more interesting passages in culinary analysis, La Mettrie opined: "Raw meat makes animals fierce, and it would have the same effect on man. This is so true that the English who eat meat red and bloody, and not as well done as ours, seem to share more or less in the savagery due to this kind of good."⁹⁵

Climate, age, blood circulation, inheritance, and gender were other physical factors dictating a human being's rational nature.⁹⁶ According to La Mettrie, the physical weakness of women leads to their natural tenderness, emotionalism, and superstitions. "Man, on the other hand, whose brain and nerves partake of the firmness of all solids, has not only stronger features but also a more vigorous mind."⁹⁷ In sum, "everything depends on the way our machine is running."⁹⁸

Applying his model of physical causes to crime, La Mettrie argued that "there are a thousand hereditary vices and virtues which are transmitted from parents to children as those of the foster mother pass to the children she nurses."⁹⁹ Unlike some future materialists, La Mettrie believed that even the hereditarily vicious were not completely outside the bounds of morality. He had "no doubt that the wildest and most savage have some moments of repentance."¹⁰⁰ Nevertheless, he did believe that a person might be forced to commit an "involuntary crime" that he only regretted after the

fact. In order to sort out involuntary crimes from the rest, La Mettrie proposed that “physicians might be the only judges. They alone could tell the innocent criminal from the guilty. If reason is the slave of a depraved or mad desire, how can it control the desire?”¹⁰¹ In advocating this turnover of the courts to the medical profession, La Mettrie said that he did not “mean to say that all criminals are unjustly punished; I only maintain that those whose will is depraved, and whose conscience is extinguished, are punished enough by their remorse when they come to themselves.”¹⁰²

A substantial part of La Mettrie’s treatise was devoted to attacking the belief that an unbridgeable gulf separated human beings from animals. “The transition from animals to man is not violent, as true philosophers will admit,” contended La Mettrie.¹⁰³ “Man is not moulded from a costlier clay; nature has used but one dough, and has merely varied the leaven.”¹⁰⁴ According to La Mettrie, the traits traditionally identified as the basis for man’s uniqueness—his intellectual and moral capacities—are not unique to man and are displayed by animals as well.

The intellectual capacities of animals are demonstrated by their “varying capacity . . . to learn.” Some animals “learn to speak and sing; they remember tunes, and strike the notes as exactly as a musician. Others, for instance the ape, show more intelligence.”¹⁰⁵ Yet here La Mettrie admitted a problem. Apes are definitely more intelligent than many other members of the animal kingdom, but he acknowledged that they cannot learn music. What could be the reason for this strange inability in an otherwise intelligent creature? La Mettrie thought it was “some defect in the organs of speech.”¹⁰⁶ But he also thought that the defect could be remedied. If human deaf mutes can be taught to talk and converse, surely apes can as well.¹⁰⁷ According to La Mettrie, there was nothing mysterious in how to raise apes to men, because there was nothing mysterious in how men acquired their own rational faculties. “Man has been trained in the same way as animals. He has become an author, as they became beasts of burden. A geometrician has learned to perform the most difficult demonstrations and calculations, as a monkey has learned to take his little hat off and on, and to mount his tame dog.”¹⁰⁸

Animals also demonstrate the capacity for morality. A dog who bit his master “seemed to repent a minute afterwards; it looked sad, ashamed, afraid to show itself, and seemed to confess its guilt by a crouching and downcast air.” Similarly, there was “a lion which would not devour a man abandoned to its fury, because it recognized him as its benefactor.”¹⁰⁹ According to La Mettrie, animals show evidence of a natural moral law just as much—or perhaps more than—human beings.

Lest some people think that he was insulting human beings by implying that they are on the same level as animals, La Mettrie assured his read-

ers that the opposite was in fact the case. He was actually doing man “honor to place him in the same class” as animals.¹¹⁰ That is because men are in so many ways lower than animals in their native abilities. What many animals know by instinct men must learn by education through trial and error.¹¹¹ Only education, concluded La Mettrie, “raises us from the level of the animals and lifts us above them.” But not all human beings are in fact higher than the animals. In a chilling passage, he asks:

Shall we grant this same distinction [of being above the animals] to the deaf and to the blind, to imbeciles, madmen, or savages, or to those who have been brought up in the woods with animals; to those who have lost their imagination through melancholia, or in short to all those animals in human form who give evidence of only the rudest instinct? No, all these, men of body but not of mind, do not deserve to be classed by themselves.¹¹²

Underlying every part of *Man a Machine* is La Mettrie’s steadfast belief that there is no mystery in attributing mind to matter. Rejecting Locke’s ambivalence about how blind matter could produce mind, La Mettrie asserted that “given the least principle of motion, animated bodies will have all that is necessary for moving, feeling, thinking, repenting.”¹¹³ Even so, La Mettrie tempered this assertion by refusing to claim that the universe as a whole had to be the product of blind chance. He admitted the logical possibility of a creator who infused the universe with purpose, although he chose to remain agnostic on the subject. He thought the arguments both for and against God were inconclusive.¹¹⁴ Similarly, he did not deny outright the possibility that material bodies might have the attribute of immortality, but he again thought the relevant arguments were inconclusive.¹¹⁵

Baron d’Holbach, author of the ponderous tract *The System of Nature* (1770), was considerably less ambiguous on the subject of God. In part two of a treatise that runs for more than five hundred pages, D’Holbach makes clear that all religions can be debunked as “superstition . . . founded upon manifest contradictions,” because they mistakenly attribute natural events to “an intelligent cause, distinguished from nature.” According to d’Holbach, man creates gods after his own image, “clothing his gods with his own imbecile qualities.”¹¹⁶ Even simple theists who subscribe to a minimalist belief in a God who rules the universe by his intelligence are fools according to d’Holbach.

Like La Mettrie, d’Holbach argued that man is nothing more than a “machine”¹¹⁷ and his “soul is nothing more than the body.”¹¹⁸ In sum, “man is a being purely physical,”¹¹⁹ bound by “laws of Nature” from which “he cannot deliver himself” and from which “he cannot step beyond . . . even in thought.”¹²⁰

Those laws of nature, wrote d'Holbach, make man but the "feeble plaything in the hands of necessity."¹²¹ Man "is never the master of the determination of his own peculiar will," and hence "he never acts as a free agent."¹²² D'Holbach did not deny that human beings think that they have free will, but he concluded that this belief is an illusion. "Man . . . resembles a swimmer who is obliged to follow the current that carries him along; he believes himself a free agent, because he sometimes consents, sometimes does not consent, to glide with the stream; which, notwithstanding, always hurries him forward."¹²³ It follows from this that people who act viciously do so from necessity. In d'Holbach's view, "the wicked are never more than men who are either drunk or mad," and "it is not until tranquility is re-established in their machine" that they are able to "see the consequences of their actions" and experience remorse.¹²⁴

D'Holbach denied that his view created difficulties for the punishment of criminals. He argued that whatever the cause of a man's crime, "society possesses the right to crush the effects, as much as the man whose land would be ruined by a river, has to restrain its waters by a bank."¹²⁵ D'Holbach thus redefined justice as the deterrence of crime rather than the need to hold someone morally accountable for his or her actions. The criminal justice system is utilitarian; any policy that reduces crimes presumably serves its purpose.

However, after claiming that his fatalistic view did not raise an obstacle to punishing criminals, d'Holbach proceeded to contradict himself by stating that "the law has not acquired the right to punish [a criminal] . . . if it has failed to present to him the motives necessary to have an influence over his will."¹²⁶ D'Holbach went on to criticize society for punishing "those propensities of which it is itself the author, or which its negligence has suffered to spring up in the mind of man."¹²⁷ According to d'Holbach, society itself is the main fount of crime because of its failure to supply education and economic opportunities for everyone.

One suspects that the point of d'Holbach's criticisms was to encourage the leaders of society to restructure social institutions in order to eradicate crime. In other words, d'Holbach wanted people to use their newfound knowledge about the material causes of human behavior to try to change that behavior by manipulating material causes. Yet d'Holbach never quite said this, probably because he recognized that such advice would imply the existence of a free choice. After all, if human beings were completely determined by their physical causes, how could they be urged to step outside those causes in order to reform them?

Despite d'Holbach's reluctance to encourage people to reform the material causes that drive social ills, he was hopeful that such a reformation would in fact occur. Nature had bestowed tender hearts on many people,

and they would be led to share their humanitarian doctrine with others—under the conviction that “it will, by degrees, become a certain remedy for their sufferings, that it will produce those necessary effects which it is of its essence to operate.”¹²⁸ One can already see in these statements the seeds of the doctrine of inevitable progress. It was a doctrine that would reappear with a vengeance in future decades.

As articulated by La Mettrie, d’Holbach, and others, the materialistic philosophy of the eighteenth century promised to expand man’s knowledge by unlocking the secrets of life itself. Like the mechanic who understands the innermost operations of a machine, the materialist scientist looked forward to understanding the most intricate inner workings of man. Armed with this knowledge, he could hope to obtain the kind of knowledge that had previously been reserved for God.

In a lecture on probability delivered at the end of the eighteenth century, French mathematician Pierre-Simon Laplace (1749–1827) proclaimed that an intelligence that could grasp “at a given instant . . . all the forces by which nature is animated and the respective situation of the beings that make it up” could derive a mathematical formula that would explain everything that would ever happen.¹²⁹ “For such an intelligence nothing would be uncertain, and the future, like the past, would be open to its eyes.” Laplace regarded science as the pursuit of omniscience. While he acknowledged that man would “always remain infinitely distant from this intelligence,” he held forth God-like knowledge as the lofty goal to which scientists should aspire. As much as possible, scientists should seek to reduce the behavior of everything in the material universe to mechanical laws that could be expressed in terms of mathematics. With the promise of such knowledge came the possibility of incredible new powers, even power over life itself, which was the Holy Grail pursued by scientists like Giovanni Aldini who were trying to reanimate dead bodies.

It would be wrong to suggest that everyone in the eighteenth century was smitten by the return of materialism, for they weren’t. La Mettrie, d’Holbach, and their compatriots received more than their share of notoriety and opposition. Most philosophers and scientists continued to insist on man’s uniqueness and ostracized wholesale materialists.¹³⁰ La Mettrie was even attacked by his own publisher, who wrote a treatise in response titled *Man, More than a Machine*.¹³¹ But unlike in the 1600s, when almost no one took materialism to its logical conclusions, the materialist vision in the eighteenth century was clearly making inroads among the elites. By the end of the century it had even gained a muse. In England, a latter-day Lucretius was enshrining the materialist account of the creation of life in his poetry. Describing the generation of the first life on earth, he wrote:

First HEAT from chemic dissolution springs,
And gives to matter its eccentric wings . . .
ATTRACTION next, as earth or air subsides,
The ponderous atoms from the light divides . . .
Last, as fine goads the gluten-threads excite,
Cords grapple cords, and webs with webs unite . . .
Hence without parent by spontaneous birth
Rise the first specks of animated earth.¹³²

The poet who penned this ode to spontaneous generation was Erasmus Darwin (1731–1802). Actually, he was a part-time poet. A physician by profession, he dabbled in all things scientific, even becoming an early proponent of biological evolution.¹³³ During the century about to unfold, his grandson Charles (1809–82) would help spread materialism to the masses by seeming to place it on a solid scientific footing.